Tech Fact Sheet

DOE-Environmental Management   *DOE-Complex Wide*

Techniques and Technologies for Field Detection of Asbestos Containing Materials

Challenge

Asbestos has been used in numerous applications at DOE sites including sprayed-on fireproofing, asphalt and vinyl floor tile, and asbestos-cement (transite) siding. Inhalation of asbestos can result in non-malignant asbestosis, lung cancer and mesothelioma in workers. Currently, 40 CFR 763, Subpart E requires a certain number of bulk samples of suspected asbestos-containing material (ACM) to be collected within each designated homogeneous area (HA). If real time (or near-real), in-situ detection techniques/technologies of ≤ 5, and preferably ≤ 3 weight percent asbestos, were available, sample numbers collected for laboratory analysis per HA could be minimized. Such a reduction in sampling intensity would lower worker exposure to these asbestiform contaminants, reduce expense in the characterization of asbestos contaminated areas and expedite facility survey and abatement activities at sites contaminated with asbestos (which in general means every facility undergoing deactivation and decommissioning [D&D]).

Technical Solution

MSE Technology Applications, Inc. was tasked with identifying commercially available field-portable or field-transportable instrumentation and/or techniques that would expedite facility survey and abatement activities at sites contaminated with asbestos. Five technologies were selected for bench scale evaluation:

- Laser-Raman Spectroscopy
- Thiazol Yellow Dye-Fluorescence Technique
- Diffuse Reflectance Near-Infrared Spectrometry
- X-Ray Fluorescence Spectrometry
- X-Ray Diffraction Spectrometry

After initial evaluations, three technologies were selected for field testing at MSE's Butte, MT facilities and at Oak Ridge National Laboratory (ORNL) in Oak Ridge, TN:

- X-Ray Fluorescence Spectrometry (Innov-X Systems' Alpha XRF)
- X-Ray Diffraction Spectrometry (InXitu's Terra XRD)
- Diffuse Reflectance Near-Infrared Spectrometry (Polychromix's PHAZIR DRNIR)

Alpha XRF   Terra XRD   PHAZIR DRNIR

Site Project & Identifier	Tech Stage: Field Testing
DOE complex (detection and quantification of asbestos-containing materials)	Field testing of techniques and technologies for detection of asbestos-containing materials.

EM *Environmental Management*
safety ❖ performance ❖ cleanup ❖ closure

Tech Accomplishment

Field demonstrations were conducted at the Steward Mine Yard and the Montana Economic Revitalization and Development Institute's Thornton Building, in Butte, Montana, in June 2009; and at the Oak Ridge National Laboratory (ORNL) Building 2018 in September 2009. Based on field data which was generated the XRF and DRNIR instruments detected asbestos in known asbestos locations and correctly identified non-asbestos areas as well. The XRD instrument was used at fewer locations as its sample/response time was longer. Samples were also collected to be analyzed in the laboratory to confirm the instrument readings in the field. The demonstration showed that a robust, commercially available field instrument exists to identify asbestos-containing materials, which could subsequently reduce the number of bulk samples requiring laboratory analysis, characterize large areas efficiently, and decrease worker exposure. The major issue at present is the need for robust, instrument-specific calibration models and associated software that allows sorting of suspect ACM (by <3%, >3% concentration categories) at $\geq$ 90% confidence in the results.

Impact

Portable and hand-held asbestos detection can save sampling and characterization costs as well as compress D&D schedules. These types of instrumentation can provide real time data and can be used both to characterize buildings for D&D as well as in plant operations to identify asbestos hazards prior to maintenance. Given increased market demand and competition between technology vendors, instrument-specific performance should improve while costs could decline.

Impact and Features

- Field detection of asbestos-containing materials

- Reduced number of bulk samples requiring expensive and onerous laboratory analysis

- Large areas can be characterized efficiently

- Portable/transportable system

Vendor/Provider Information	Innov-X Systems, Inc Woburn, MA 781 938-5005 InXitu, Inc. Campbell, CA 408 871-1911 Polychromix, Inc. Wilmington, MA 978 657-5921
Tech Information Provider	Jeff LeFever, MSE 406 494-7100 jeff.lefever@mse-ta.com
Technology Name	Asbestos Field Portable/Transportable Detection Unit [MSE-252 (October 2009)]
Federal End User Information	DOE Complex Wide
Tech User Information	TBD
Web Links	TBD
HQ Project Leads	Andrew Szilagyi, EM-44 301-903-4278 andrew.szilagyi@em.doe.gov

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Challenge Category	Tech Solution Category
• Asbestos contaminated location identification • Asbestos facility survey and sampling • Worker health and safety	• Characterization • Facility survey and abatement activity • Facility demolition and dismantlement

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